

23 July 1965

MEMORANDUM FOR THE RECORD

SUBJECT: Phase Grating Production Study Report, Project No. 99029-5

1. Work on the cited project was stopped approximately 1 June 1965 because of difficulties caused by several sources. Since that time an evaluation of the results and the circumstances which forced the work suspension has been made. Additionally, the Record of Invention for the phase gratings has been returned by the CIA Patent Committee with the opinion that there is a superseding disclosure. It is not known at this time whether this will interfere with the grating production but in view of the necessity for the gratings it is expected that production will resume by the end of September at the latest.

2. The ordinary difficulties experienced in scaling preliminary results to larger sizes were encountered. The first of these was the uneven illumination over the large 11 by 11 grating format. Several "fixes" were tried, the final being a photographic corrector sheet. This reduced the illumination unevenness but required exposure increases by as much as a factor of 10. I do not consider this a satisfactory answer to the illumination problem. One of [REDACTED] preliminary trials used a spherical convex front surface mirror. While this evaned out the illumination considerably it introduced imperfections which were traced to the surfacing. I believe we should re-surface this mirror and reduce the exposure time accordingly.

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3. Examination of the spectrum of the [REDACTED] ruling indicated the presence of periodic error in the lead screw in the engine which ruled it. This is probably unimportant for the purpose to which we are putting this ruling and it is only noted here as a matter of interest.

4. The major difficulty experienced in producing the large gratings has been traced directly to the photographic material. The requisition ordering the plates specifically stated that all the emulsion should be from the same mix or batch. Experimentation indicated that not only was the speed different but the thickness often varied. The anti-halation backing was uneven and often left roller marks on the back of the plates. The emulsion was the extra-thin type, thinner than those previously used. Altogether, the quality of the photographic materials was disappointing and is the prime cause for the failure of the project workers to produce a useful grating within specification.

Declass Review by NIMA/DOD

5. The main lesson learned from this investigation was that it will be necessary to provide tighter specifications for future requisitions of photographic materials. We must require a certification that the emulsion mix is identical for all plates shipped and that the thickness be uniform, no less than 9 microns.

6. A summary of the time and materials cost up to 1 July is as follows:

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Activity Code

755	Materials Inventory
776	Pre-contract Investigation
781	Eng & Sci Basic Investigation
783	Eng & Sci Lab Prod & Services
830	Travel

Total

Materials Cost

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 Rulings

Photographic Plates

Chemicals & Miscellaneous Materials

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Chief, Exploratory Development Laboratory Branch